

SYNTAX

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PERSONAL COMPUTERS

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IN THIS ISSUE

8K Programs	
Keyboard Scanning.....5	
Multiple Keys.....8	
Pause Without Flash....9	
TS2068 Programs	
Syntactic Sum.....7	
Advanced Video Modes...4	
Classified Ads.....10	
Hardware Review	
MD-2 Modem.....4	
Machine Code.....4,5,7,9	
New Products and Services.....3	
News	
Timex Withdraws.....1	
Future ZX/TS support...1	
Syntax Will Continue..10	
Program Improvements	
Firstloader.....2	
Syntax Errors.....2	
Users' Groups.....2	
Utilities.....4,5,7,9	
Vendor Report.....1,2	

Index of Advertisers

Byte Back Co.....7	
--------------------	--

MONEY TALKS; TIMEX LISTENS

Timex withdrew from retail sales of home computers and will employ their resources in other product lines.

SINCLAIR TO CONCENTRATE ON QL IN US

Nigel Searle announced that Sinclair does not plan to re-enter the US market with ZX81s or Spectrums. Talks with distributors (to follow QL mail order) are proceeding.

KEY SUPPORT OPERATIONS WILL STAY

SoftSync announced its intent to keep on selling its existing line of TS programs. SoftSync, 14 E. 34th St., NY, NY 10016

Byte-Back announced changes to the MD2 modem to make it compatible with all machines and provide both originate and answer tones. See review, this issue, for more details.

Microsync Services will keep offering service agreements for ZX/TS machines at \$10/yr. Write them at 162R Marlboro St., Keene, NH 03431 for details.

Profile 2068 is available now with brief operating instructions. You will get all the detailed, 100-page documentation later at no extra cost. \$29.95 ppd. Thomas B. Woods, POB 64, Jefferson, NH 03583

Tom Woods asserted whole-hearted support and will start "new, interesting products."

Timex Vice President of Marketing and Sales, C. Michael Jacobi, announced that "Consumer warranties will be honored and out-of-warranty service will continue."

Banta Software intends to continue sales of their Timex-related programs.

Robert Schiller of Kopak says their new version of Hi-Res Word Processor allows 80 column printing. He also announces a sale on Timex and Softsync software for the ZX/TS (4 cassettes for \$20) with a large selection.

SYNTAX will continue (see story p.10).

SYNTAX ERRORS: Ohm's ZXLaw,
Dec.83, line 390, should read:
390 PRINT "POWER (P)="; (V**
2)/R;" W"

PROGRAM IMPROVEMENTS

You can stop Firstloader before it translates by POKEing 45013,201. This stub leaves the ZX/TS bytes in high memory, starting at 49277. To restore the translator, you simply POKE 45013,205 and then enter the command RAND USR 45013. This trick lets you examine the original data.

VENDOR REPORT

Address complaints about Frog Software or Sinclair Computing to Regional Chief Inspector, Northeast Region, 1633 Broadway, New York NY 10097 Attn: Mail Fraud Division, 212/974-8501.

Mindware advertised a Monitor program to use with ZX/TS machines in SYNTAX Dec.83. They inform us the program doesn't work and isn't available anywhere.

Pegasus Microsystems will fill all outstanding orders but stopped accepting any after January. They will shift their business to other machines and stop selling retail.

Memotech continues to support the TS1000 although they are getting out of the Timex business.

SYNTAX received a complaint about Roger Valentine's book, The Timex-Sinclair 2068, published by John Wiley. Wiley told us that an independent reviewer, using a 2068, checked the complaint by choosing 5 programs at random and they ran without change. Ignore references to a 16K Timex 2000, the programs work on 48K 2068s. Watch out for graphics, they differ. Wiley used advance versions of Timex manuals to check the book and some problems exist because of late changes in the machine. If you note problems in this book, write to Wiley Press, John Wiley & Sons, 605 Third Ave., NY, NY 10158. They will reply to your inquiry and use your input to

correct the next printing. If you consider buying this book, satisfy yourself that you will be able to repair minor problems.

C-20 Magazine stopped publishing and has issued refunds for its undelivered issues.

Starburst Software ceased publication of ZX/TS software and gone out of business on Feb. 1, 1984.

We received another complaint of non-delivery by Kopak Creations, dated Feb.12 '84, amounting to \$40.

We've heard that Timex Town Software, Omnitronics (Z-dubber), and Jameco (keyboard conversion kits) plan to drop Timex-related lines. We also hear that Z-West newsletter stopped printing.

ZX/TS USERS' GROUPS

To check for a local group that's not listed, or to announce a new group, call 617/456-3661 or write SYNTAX, RD 2 Box 457, Bolton Rd., Harvard, MA 01451. Send SASE for name of group in your area.

Clinton, CT: Southeastern Connecticut TS User's Group meets at Hull Library. Contact Gary Cummings, 203/669-2342.

New Haven, CT: Sinclair Study Group, c/o Chris Baldwin, 16 Lewis St., New Haven, CT 06513.

Collinsville, CT: New group forming, contact David Dubay, 28 Claire Hill Rd., POB 78, Collinsville, CT 06022, 203/673-7069.

Stamford, CT: New group, contact Barbara Karp, 139 Downes Ave., Stamford, CT 06902, 203/359-2124.

Memphis, TN: Memphis User Group, **Correction:** Andy Boles, 2059 Pennel Cove, Memphis, TN 38116, 901/346-0890.

Butler, WI: New address for Sinclair Milwaukee Users Group Ltd. (SMUG), Box 101, Butler, WI 53007.

NEW PRODUCTS AND SERVICES

TS-INTERCOM, a special interest group on CompuServe, allows ZX/TS users with ZCOMM software and a modem to exchange programs and information. Contact TS-INTERCOM, 1908-715 Don Mills Rd., Don Mills, Ontario, Canada M3C 1S4, 416/424-1895, CIS ID 70261,166.

Pheonix Enterprises (1780 N. DuPont Hwy., No. 17, Dover, DE 19901, 302/734-0179) announces T/S COUNT, an accounting package (\$29.95), and OPERATION PHEONIX, a strategy game using music and hi-res color graphics (\$19.95). Both written originally for the 2068 but available for the ZX/TS at \$20 and \$14.95, respectively.

D. Lipinski Software (2737 Susquehanna Rd., Roslyn, PA 19001) offers CHECK-B, a comprehensive check book program for the TS2068. \$20 price includes cassette and a free update when Timex releases a new mass storage device for 2068s.

Textwriter 2000 TS2068 word-processor prints standard or full width pages on TS2040 (two column output). Includes full editing, reformatting, word wrap, tab stops, and block moves. \$18.95 cassette from Robert Fingerle, 39639 Embarcadero, Fremont, CA 94538.

A&J Micro Drive, a reworked Entrepo (formerly Exetron) stringy floppy works with CAI Instrument's wafers, but incorporates an improved operating system including program chaining and MC SAVE/LOAD. For ZX/TS, \$149.50 from A&J Micro Drive, 1050 "I" East Duane Ave., Sunnyvale, CA 94086, 408/732-9292.

Maples Enterprises (688 Moore St., Lakewood, CO 80215) introduces Harmonium, a 4 voice ZX/TS sound board kit utilizing normal components + \$9 sound chip. Schematic, doc. and suppliers list, \$5.

ACZ General Ledger 2.000 comes with a comprehensive instruction manual, binder, and cassette for TS2068 at \$39.95 + \$1.50 P&H. Designed to meet the accounting needs of a small business, the program produces printed reports on the TS2040 including journal, ledger, monthly and YTD income statements, balance sheets, trial balances, and a chart of accounts. Interfaces to CARDCO numeric keypad (\$44.95+\$1.50 P&H). From Cottage Technology, 5720 W. Little York, Suite 178, Houston, TX 77091, 713/448-7058.

JK Audio is back in business (POB 3295, Escondido CA 92025-0580, 619/741-5132) and offering the JK-500 series of interfaces for the ZX/TS. Features include 2 16-bit I/O ports, real time clock, ADC, and 8K nonvolatile RAM, in many different combinations, from \$125.95 to \$174.95 (bare board \$49.95), + 3% P&H (US), 8% (for).

HS-1 High Speed Interface connects two ZX/TS machines together, using one for computing and one for display. Results in steady display while running 5.5 times faster than SLOW mode. \$98 assemb., \$78 kit, from Interface Design, POB 151, Rexford, NY 12148.

Timex/Sinclair Ideabook demonstrates how to solve problems with 50 ready-to-run programs for the ZX/TS. By David Ahl, softcover, 150pp., \$8.95 from Creative Computing Press, 39 E. Hanover Dr., Morris Plains, NJ 07950.

Adropos Technology (1071-A Avenida Acaso, Camarillo, CA 93010, 805/482-3605) announces SIN-16, a 16K RAM (\$25.95+\$4 P&H), Dr. Floyd, an Eliza like program, Graphics Pak 1, five programs for drawing and saving graphics, and Wordplay, five game programs for teaching literature and grammar (\$12.95 ea or \$25 for all 3, plus \$2 P&H), all for ZX/TS machines.

HARDWARE REVIEW

Product: MD-2 Modem
Machines: ZX/TS 2K or 16K
From: Byte-Back Co.
Rt 3 Box 147, Brodie Rd.
Leesville SC 29070
803/532-5812
Price: \$149.95 Assem.
\$119.95 Kit

Byte-Back continues their tradition of fine products for the ZX/TS with the MD-2, an originate only direct connect modem with software for ASCII translation, program and text upload/download, and printing (RS232 or TS2040).

Since the introduction of the MD-2B, Byte-Back no longer sells the MD-2. The MD-2B can originate or answer via a hardware switch, but in all other respects is an MD-2. None of the modems answer the phone or dial. Byte-Back has upgrade kits from MD-2 to MD-2B. They also sell a TS2068 Modem with identical features, same price, under the name MD-68. You can get a kit allowing you to switch your MD-2 or 2B to a MD-68 at will.

ZCOMM, the software provided with Byte-Back modems, comes on cassette with a 2K RAM version on one side, and a 16/64K version on the other. Both versions are recorded twice with different recorders to ensure the tape will load. It seems a sturdy program.

Several times during testing the modem I thought I had uncovered a bug in ZCOMM, but it turned out to be a feature: when storing text from the phone line into program memory, ZCOMM's stores the bytes in memory. When memory fills, the system appears to crash. Actually, it munches the text for a while (over a minute) and turns it into REM statements. This way, you can store an entire conversation in memory, then SAVE or LLIST it.

For a sturdy product with better support than you'll get from Timex, get the MD-2B.

RECIPES FOR 2068 ADVANCED VIDEO

Your TS2068 can display lines of 64 characters, more detailed color, or a completely separate display file. We show you how to activate these functions and plot hi-res (512x192) points.

First, use program 1 to move system variables out of the area used by DFILE 2, change video mode, and clear DFILE 2. Timex supplied this machine code. LOAD & RUN it; use p.248 of your 2068 manual to choose video mode. (Mode 62 gives the best 64 col. display.)

Now use program 2 to accept Y,X-pairs and plot on the 64-column screen. Prior plots aren't erased.

Hints: G=file number (0-1)
K=high digits, character line (0-2)
I=scan line in character line (0-7)
J=low digits, character line (0-7)
H=character position in line (0-31)
S=dot position in character (7-0)

POKE 01GK KIII JJJH HHHH,SSS
Binary: High byte Low byte,Data

```

1 REM Don't NEW after this
2 CLEAR 65399
3 READ A,B,C,D,E,F
4 DATA 10,11,12,13,14,15
10 READ G$
15 LET P=1
20 FOR X=65400 TO 65437
30 LET X$=G$(P TO P+1)
40 LET V=VAL (X$(1))*16+VAL (X
$(2))
50 POKE X,V
60 LET P=P+3
70 NEXT X
80 INPUT "Video Mode:";U
90 POKE 65412,U
95 RANDOMIZE USR 65400
100 DATA "F3,3E,01,D3,F4,DB,FF,
CB,FF,D3,FF,3E,01,F5,FB,CD,8E,0E
,F3,DB,FF,CB,BF,D3,FF,AF,D3,F4,F
1,FE,80,20,03,32,C2,5C,FB,C9"
SYNTACTIC SUM: 23223, TS2068
5 DEF FN R(N,D)=N-INT (N/D)*D
7 OUT 255,62
10 INPUT "Y<=191 from top? ";Y
20 LET KK=INT (Y/64)
30 LET JJJ=INT (FN R(Y,64)/8)
40 LET III=FN R(FN R(Y,64),8)
50 INPUT "X<=511 fm left? ";X
60 LET HHHH=INT (X/16)
70 LET G=INT (FN R(X,16)/8)
80 LET SSS=FN R(FN R(X,16),8)
90 LET DAT=2+(7-SSS)
110 LET ADDR=16384+G*8192+KK*20
48+III*256+JJJ*32+HHHH
120 POKE ADDR,DAT
130 GO TO 10
SYNTACTIC SUM: 20919, TS2068

```


KEYBOARD SCANNING

Your 2068 uses ports to scan its keyboard, as do all Sinclairs. Each uses the same addresses, but the data differs.

As you know, Sinclair uses the CPU to scan its matrix keyboard. Forty keys, arranged as 8 half-rows of 5 keys each, provide all the functions. Additional keys simply connect parallel to a primary key.

From the ZX/TS schematic, we know that the 5 lines KBD0-KBD4 connect vertical columns of keys--0 connecting SHIFT, A, Q, I, O, P, ENTER, and SPACE; 4 connecting V, G, T, 5, 6, Y, H, and B. You'll find this pattern from Z to SYMBOL SHIFT, X to M, and C to N.

Each half-row connects to one ADDRESS line of the CPU. As you see in Figure 1, the half-row connects to A8-A15 (via a diode).

When Z80 processors execute a port command--IN or OUT--the lines A8-A15 contain a number from one of the registers. The instruction IN r,(C) reads the port number held in C, places the data read in r, and puts register B on address lines A8-A15 during the read (see p. 254 of the Zilog programming manual). If r stands for register A, this assembles to ED, 78 (237, 120 dec.)--just what you find in the Spectrum at 0296H (662 dec.). C contains the port address FE (254). By using LD BC,portadd followed by IN A,(C) we can specify portadd as the 16 bit number to place on the address bus during a port read. Effectively, we get 16 bit port addresses. Now let's arrange the data from the Spectrum manual.

BC Register	Scanned	BC Register
Hex	Dec	Hex
F7FE	63486	3 1-5 0-6 4 61438
FBFE	64510	2 Q-T P-Y 5 57342
FDFE	65022	1 A-G NR-H 6 49150
FEFE	65278	0 CS-V SP-B 7 32766

Note that register C always holds FE, port 254, to read the keyboard. Register B sequences

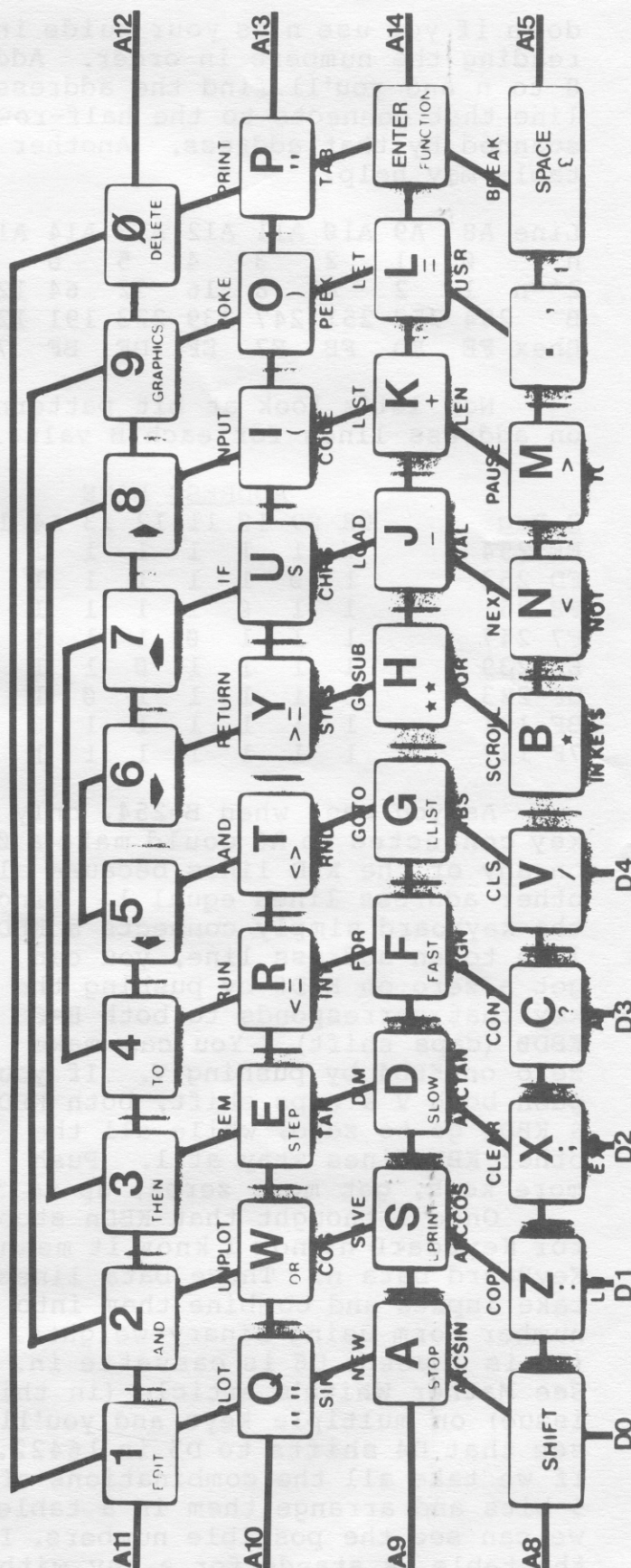


Figure 1. ZX/TS Keyboard Wiring

down if you use n as your guide in reading the numbers in order. Add 8 to n and you'll find the address line that connects to the half-row scanned by that address. Another table may help.

Line	A8	A9	A10	A11	A12	A13	A14	A15
n	0	1	2	3	4	5	6	7
2**n	1	2	4	8	16	32	64	128
B	254	253	251	247	239	223	191	127
Bhex	FE	FD	FB	F7	EF	DF	BF	7F

Now let's look at bit patterns on address lines for each B value.

		ADDRESS LINE							
B	Reg	08	09	10	11	12	13	14	15
FE	254	0	1	1	1	1	1	1	1
FD	253	1	0	1	1	1	1	1	1
FB	251	1	1	0	1	1	1	1	1
F7	247	1	1	1	0	1	1	1	1
EF	239	1	1	1	1	0	1	1	1
DF	223	1	1	1	1	1	0	1	1
BF	191	1	1	1	1	1	1	0	1
7F	127	1	1	1	1	1	1	1	0

As you see, when B=254, only a key connected to A8 could make a 0 on any of the KBD lines because all other address lines equal 1. Since the keyboard simply connects a KBD line to an address line, you can get a zero on KBD0 by pushing the key that corresponds to both B=FE & KBD0 (caps shift). You can make zero on KBD4 by pushing V. If you push both V & caps shift, both KBD0 & KBD4 go to zero, while all the other KBD lines stay at 1. Push more keys, get more zeros, up to 5.

Once I thought that KBDn stood for KeyBoard n; now I know it means KeyBoard Data n. Those Data lines take inputs and combine them into number form using binary weights. (D5 is unused; D6 is cassette in. See Mather White's article (in this issue) on multiple keys and you'll see that D4 shifts to D5 in 16422.) If we take all the combinations of 5 bits and arrange them in a table, we can see the possible numbers. In the table, # stands for a key with no letter--a SHIFT, SPACE or ENTER.

Number	D0	D1	D2	D3	D4	Keypress
31	1	1	1	1	1	NO KEY
30	0	1	1	1	1	#AQ10P##
29	1	0	1	1	1	ZSW29OL#
27	1	1	0	1	1	XDE38IKM
23	1	1	1	0	1	CFR47UJN
15	1	1	1	1	0	VGT56YHB
Binary Val	1	2	4	8	16	

See that if you press no key, all the data bits equal one and the machine sees 31. Pressing one key makes the corresponding bit equal zero and subtracts the binary value from 31 to generate the number in the left column. If you read down any column under the keypress heading, you will recognize a half-row of your computers keyboard. On the right side of the computer, the keys read from right to left, just what you expect when you look at a ZX/TS schematic for the key matrix.

Well, what if you push more than one key? Stay in one half-row and you will generate the remaining numbers. If you push keys in other rows, the keyscan routine will sort them as B takes different values.

Every combination of keys in a half-row generates a unique value. Pressing combinations subtracts the key-values from the no-key value.

Although Sinclair machines do not use this keyboard property, you can see it with a simple program on your 2068. If you enter:
100 PRINT AT 0,0;IN 65022:GO TO 100
you can press ASDFG half-row keys in combination and see what values result. Change the argument of IN to 57342 and you move to the POIUY half-row. Try each address shown in the first table of this article. Notice that the value depends only on position in the half-row; half-row selection varies with address.

Now try this. With no key pressed, and the preceding one-line program entered, put a tape in your recorder and play it into the machine. Notice that the number on your screen changes. As bits come in from the EAR jack, D6 goes to 1, and the number jumps to 95 (31

because no key is pressed plus 64 from the D6 line).

Spectrum computers differ slightly in the values returned for keypresses. But the differences are regular and understandable.

Machine	No-Key	D	D	D	D	D	D	D	D
Name	Value	0	1	2	3	4	5	6	7
TS1000	63	1	1	1	1	1	1	0	0
TS2068	31	1	1	1	1	1	0	0	0
SPECTRUM	255	1	1	1	1	1	1	1	1
SPECTRUM3	191	1	1	1	1	1	1	0	1

As Robert La Jeunesse pointed out in SYNTAX (Oct.83, p22), you need only use LD BC,portadd plus an IN A,(C) to achieve register indirect addressing on your ZX/TS computer. For convenience, we will also use RAND to convert decimal to hex and store the result in the system variable SEED (16434,5). (A trick we learned from the June 1983 issue of the Sinclair-Timex User Group Newsletter published by The Boston Computer Society.) To get the widest possible application of this, let's set RAMTOP below 1K and use a routine that can run on a ZX81, but make the machine code run independent of location. This code simulates IN for your ZX/TS.

```
POKE 16388,236;Set RAMTOP To 17388
POKE 16389,67
```

NEW

```
POKE 17388,237;ED LD BC,(nn)
POKE 17389,75 ;4B nn=SEED
POKE 17390,50 ;32 Address of SEED
POKE 17391,64 ;40 sys var (16434)
POKE 17392,237;ED IN r,(C) r=A
POKE 17393,120;78
POKE 17394,6 ;06 LD B,0
POKE 17395,0 ;00
POKE 17396,79 ;4F LD C,A
POKE 17397,201;C9 RETURN TO BASIC
```

Now use this BASIC loop:

```
10 INPUT N (n is a number from our
20 RAND N first table.)
30 LET X=USR 17388
40 PRINT AT 0,0;N,X
50 GOTO 30
```

Special thanks to Andy Boles & his users' group, 2059 Pennel Cove, Memphis, TN 38116, 901/346-0890

In Stock! MD2B Smart MODEM \$119.95 kit
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(MD68 TS2068 Version and upgrade avail)

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SYNTACTIC SUM--TS2068

This program calculates Syntactic Sums for TS2068 programs. The number returned by USR 65500 should match the one printed after our program listings. The program runs anywhere in RAM.

Syntax, Inc. hereby grants everyone the right to use the this program, to generate Syntactic Sums and to publish them with programs. Replication is strictly prohibited without our written consent.

Michael S. Shaw, Enfield CT

```
5 REM 2068 Syntactic Sum
10 CLEAR 65499
20 FOR a=65500 TO 65534
30 READ d
40 POKE a,d
50 NEXT a
60 PRINT "TS2068 Syntactic Sum
Loaded"
70 PRINT "Use PRINT USR 65500
to execute."
80 DATA 167,042,075,092,237,07
5,083,092,080,089,237,066,035,22
9,033,000,000,193,011,120,177,04
0,009,197,025,019,005,000,079,00
9,024,241,068,077,201
SYNTACTIC SUM: 22803, TS2068
```

DETECTING MULTIPLE KEYS

INKEY\$ returns the character of the key currently being pressed, returning the empty string for no key and for multiple keys. But you can use the system variables and a few bytes of machine code to detect multiple keys of your choosing.

Memory locations 16421 & 16422 store a keyboard matrix code for the keys currently held down. Your ZX/TS system calls these system variables LAST_K; they have no direct counterpart in Spectrum and 2068 machines.

Contents of 16421			16422
KEY	Bit=0		Bit=0
ZXCV	0	SHIFT	0
ASDFG	1	AQ10P##	1
QWERT	2	ZSW29OL.	2
12345	3	XDE38IKM	3
09876	4	CFR47UJN	4
POIUY	5	VGT56YHB	5
#LKJH	6	(# means shift,	
#.MNB	7	enter, or break)	

Both locations are all ones (255 dec.) when no key is pressed. When you push a key, one or more bits in each system variable become zero. For example, depressing B makes bit 7 of 16421 and bit 5 of 16422 go to zero. All other bits remain set to 1. So the contents of these locations for B equal:

(16421)=01111111=127

(16422)=11011111=223

Only the SHIFT key works with a different pattern--bit 0 of 16422 becomes 0 while all bits of 16421 remain 1. In typing, you use SHIFT with another key, and the exception permits the ZX/TS to allow one two-key pair while rejecting other combinations.

Thus, SHIFT B returns:

(16421)=01111111=127

(16422)=11011110=222

Use the following program to

see these patterns on your screen. Compare the results to the charts preceding.

```

10 GOTO 1000
30 LET K$=INKEY$
40 IF K$="" THEN GOTO 30
50 RETURN
60 SCROLL
70 LET Z=16421
80 LET A(S)=PEEK Z
90 LET A(S+5)=PEEK (Z+5)
95 PRINT K$;S#;
100 FOR D=3 TO S+5
110 LET A=A(D)
120 PRINT A;S#;
130 FOR F=7 TO 0 STEP -1
140 LET X=2**F
150 PRINT A>X;
160 IF A>X THEN LET A=A-X
170 NEXT F
180 PRINT
190 NEXT D
200 GOSUB 30
299 GOTO 80
1000 DIM A(2)
1100 LET S#=""
1200 LET S=PI/PI
1500 GOSUB 30
1999 GOTO 80
SYNTACTIC SUM: 22782, 8K ROM

```

A	253	111111101	253	111111101
S	253	111111101	251	111111011
D	253	111111101	247	111101111
T	253	111111101	239	111011111
G	253	111111101	223	110111111
V	254	111111110	223	110111111
O	253	111111101	223	110111111
T	251	111111011	223	110111111
S	247	111101111	223	110111111
B	239	111011111	223	110111111
Y	223	110111111	223	110111111
H	191	101111111	223	110111111
B	127	011111111	223	110111111
>	127	011111111	246	111101110
+	191	101111111	246	111101110
(	223	110111111	246	111101110
I	223	110111111	247	111101111
K	191	101111111	247	111101111
M	127	011111111	255	111111111

When you run this program, hold the key down until the first decimal value prints.

Now we can construct a machine code routine to detect multiple-key presses. But first we will need to choose a specific set of keys to test for. Use the preceding charts to see which bits should equal 0. (Convert them to decimal if you wish.) Now change all the ones to zeros and all the zeros to ones. (Subtract from 255 if you are using decimal.) POKE these new values in locations 16519 and 16523.

For example to test for S, G & A, you must decide which bits to zero. From the preceding tables we see these required zeros:

	16421	16422
Letter	Bit=0	Bit=0
S	1	2
G	1	5
A	1	1

So we need the following:

(16421)=11111101=253

(16422)=11011001=217

To get the values needed for our program, we must reverse all 1s and 0s, bit by bit (complement the number). You can do this using the decimal values by subtracting them from 255. Thus:

11011001=217

+00100110= 38

11111111=255

So we will use 2 and 38 as values to put into our sample MC program.

Now use the following machine code routine to test for a specific combination of depressed keys.

```
1 REM E9RND7 NEW ""? NEW A""
= TAN
SYNTACTIC SUM: 1848, 8K ROM
42 37 64 125 230 2 192 124
230 38 192 1 0 0 201
```

Now enter:

```
2 PRINT USR 16514
3 SCROLL
4 GOTO 2
RUN
```

When you press the selected keys, you'll see a zero on-screen, otherwise you get 16514. So if you use IF NOT USR 16514 THEN...instead of IF INKEY\$=...THEN..., you can test for more than one key. This extends your ability to write two-player games or to make combination locks for your programs.

Mather White, Rome PA

[Values stored in 16421 & 16422 are related to the numbers we generated in KEYBOARD SCANNING. Except for the SHIFT key, the content of 16421 equals the B-register value that scans a half-row. Bits 1 through 5 of 16422 equal the data line inputs

D0-D4. For the SHIFT key, 16421 holds 255, and 16422 holds 254.

Cassette input values do not show up in these variables, despite their appearance in keyscans.--KO]

PAUSE WITHOUT FLASH

PAUSE n makes your ZX/TS display a screen for n/60 seconds or until a key is pressed. If n exceeds 32767, your computer waits until you press a key. If that key was down when the PAUSE began, the computer ignores it--you must press another. In SLOW mode, the screen flashes at the end of the PAUSE.

You can avoid these problems with the following MC routines. If flash bothers you, use the first of these in a 1 REM to control PAUSE without flash, and without ignoring keys already down when it starts.

```
1 REM 5 ACS UNPLOT 60RNDUPRN
DACS ?""UARNDW""/ NEXT
SYNTACTIC SUM: 2510, 8K ROM
33 128 0 203 252 34 52 64
58 53 64 203 119 192 58 38
64 60 192 24 243
```

Set this up with:

```
LET A=length of pause-1
POKE 16515,A-256*INT(A/256)
POKE 16516,INT(A/256)
AND start it with LET L=USR 16514.
```

If you simply want to wait for a keypress, you can substitute this code for PAUSE 4E4:

```
1 REM UARNDW""/ RAND
SYNTACTIC SUM: 1047, 8K ROM
58 38 64 50 192 24 249
```

Mather White, Rome PA

You can use this MC REM loader to get the numbers listed in Mather White's articles into the REM statements. Be sure to start with line 1 containing as many X's as bytes in the MC, then enter the numbers one at a time. Stop with STOP followed by ENTER.

```
1 REM XXXXXXXX
2 LET A=16514
3 INPUT D
4 POKE A,D
5 LET A=A+1
6 GOTO 3
SYNTACTIC SUM: 4031, 8K ROM
```

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